

ABSTRACT OF THE DISCLOSURE

The present invention provides spheroidal particles of coal slag. The spheroidal particles have at least a hard outer shell, a diameter in the range of about 0.001 mm to 5 mm and comprise SiO_2 , Al_2O_3 , Fe_2O_3 , FeO , CaO , Na_2O and K_2O . The present invention also provides a process for spherulizing irregularly shaped particles of coal slag ^{and agglomerated coal fly ash}. The process includes the steps of: (a) providing a drop tube having an upper portion, a central portion and a lower portion; (b) delivering a feedstock of irregularly shaped particles of coal slag ^{and agglomerated coal fly ash} to the upper portion of the drop tube at a rate at which the particles remain individualized; (c) heating the particles to a sufficient temperature by providing heat to the outer surface of the central portion of the drop tube to cause at least the outer surface of the particles to melt such that a majority, i.e., at least 50 weight percent, of the particles become spheroidal due to surface tension; and (d) cooling the particles, preferably in the lower portion of the drop tube, to prevent agglomeration. The present invention further provides an apparatus for spherulizing particles comprising: (a) a substantially vertical elongate drop tube; (b) a feed tube extending into the upper terminal portion of the drop tube and having a substantially closed lower terminal portion with a discharge port therein, the vertical axis of the discharge port being substantially on the vertical axis of the drop tube; (c) feed means for supplying a feedstock to the feed tube; (d) vibrating means for intermittently rapping the feed tube to cause discharge of the feedstock from the feed tube in a substantially vertical downward path through the drop tube as individualized particles; (e) heating means proximate the outer portion of the drop tube and proximate a central portion of the drop tube, the heating means being capable of providing sufficient heat within the drop tube to cause the viscosity of at least the outer portion of the particles to become sufficiently low to allow the surface tension of the particles to spherulize the particles; (f) cooling means to effect cooling of the spherulized particles such that the particles do not adhere to each other; and (g) means for collecting the spherulized particles.